STEAMVR™ HARDWARE

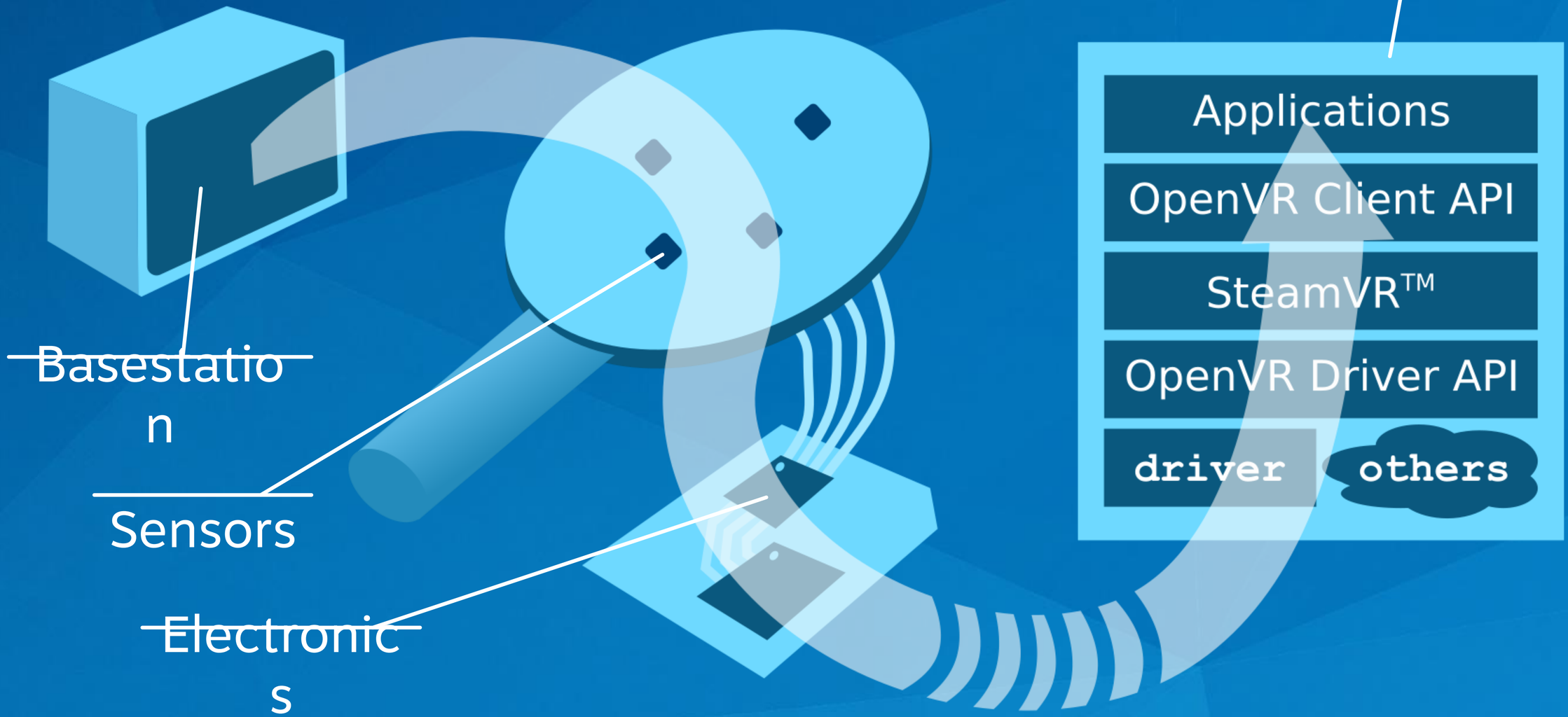
Ben Jackson

Agenda

- ~~Lighthouse~~ SteamVR™ Tracking Overview
- Technology Update
- Growing the Audience
- Licensing program and training class
- OpenVR

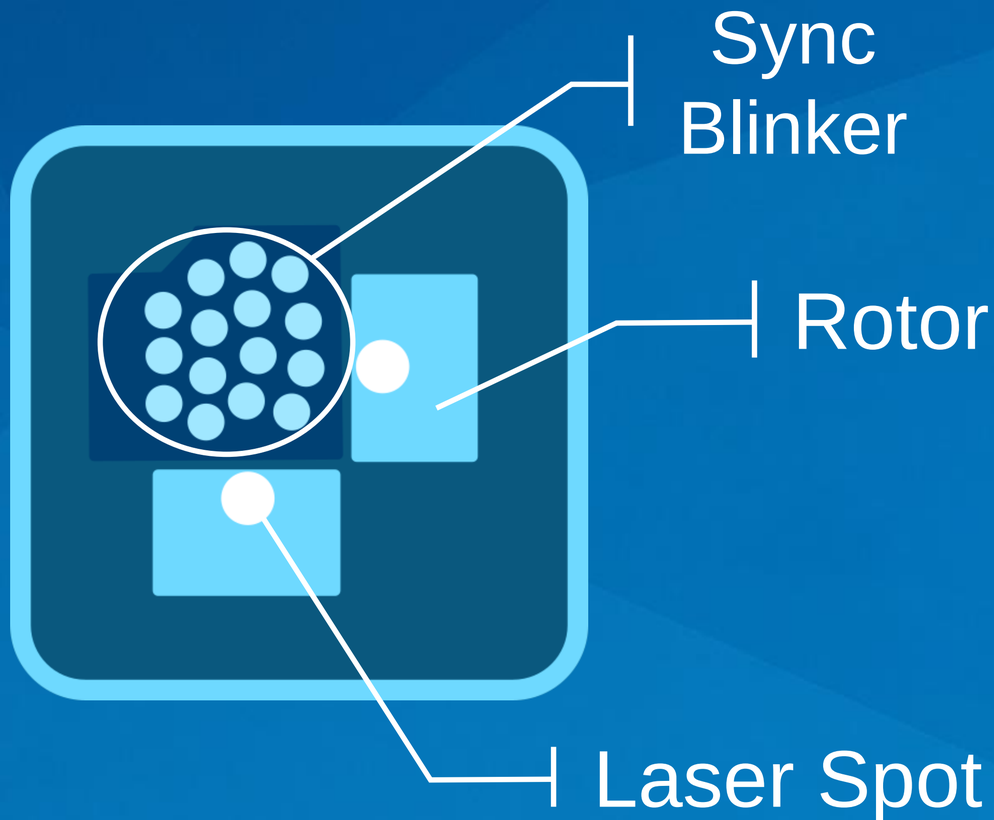
SteamVR™ Tracking

System Overview



How it Works

Basestation

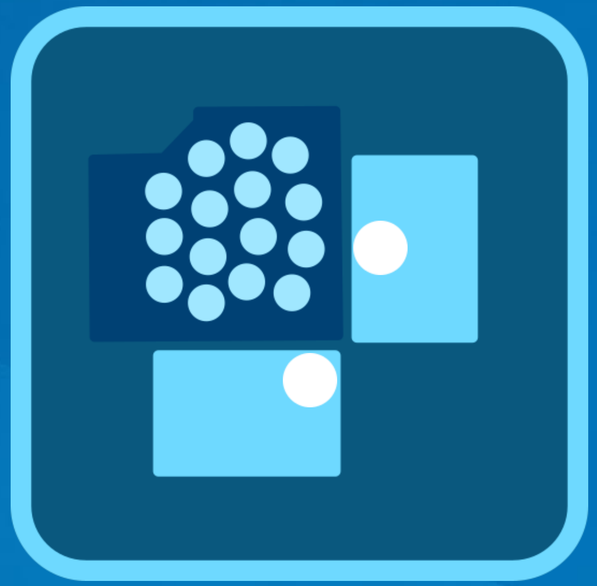


- Plugs into your wall, not your PC.
- Everyone can share
- 120° Field of View

Standalone is Important

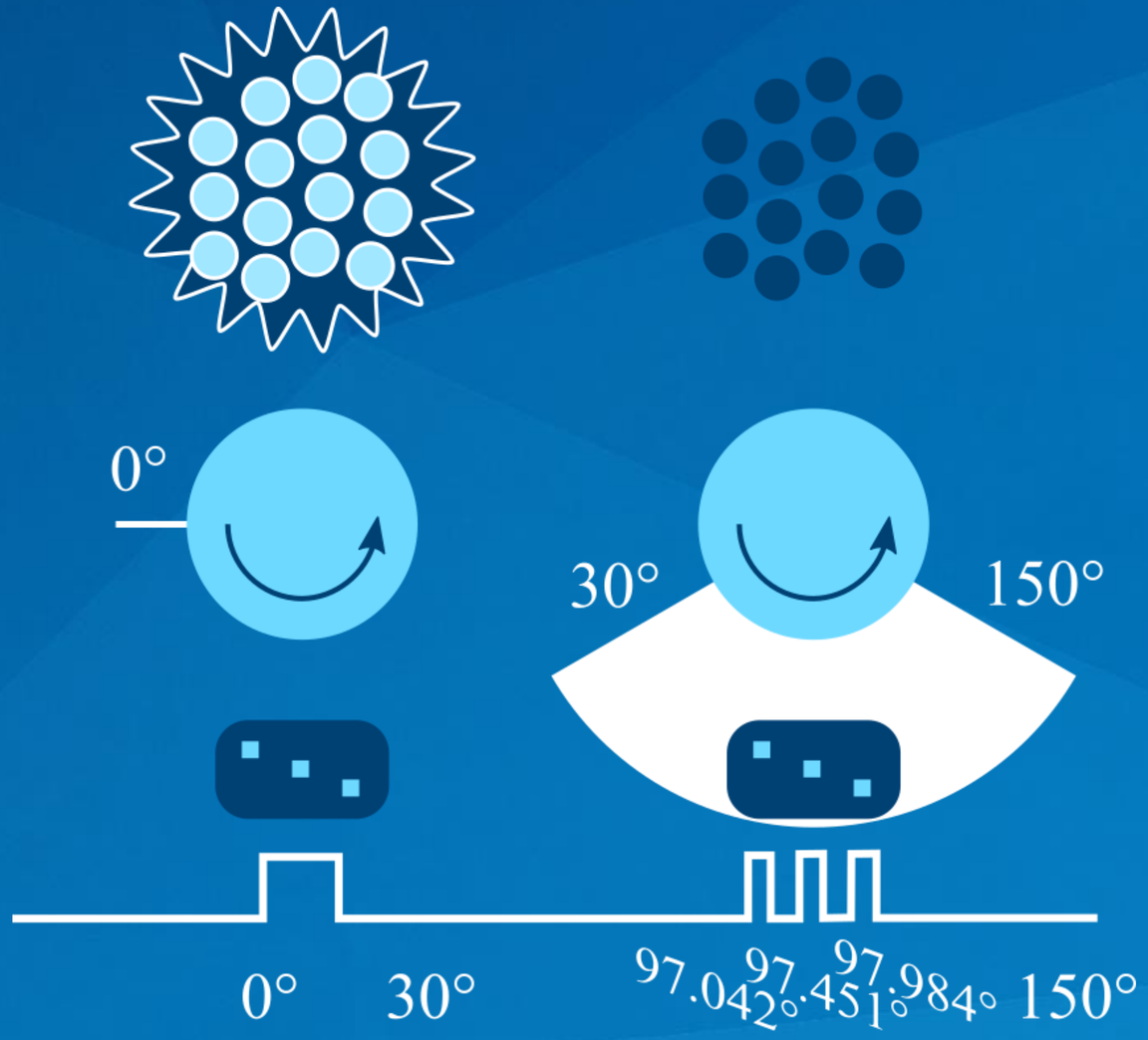
- Autonomous
- Enables Backpack PCs for VR
- Mobile VR
- Scalability

Look with an IR Sensitive Camera



The Laser Line

Turning Time into Angle



For Each Rotor

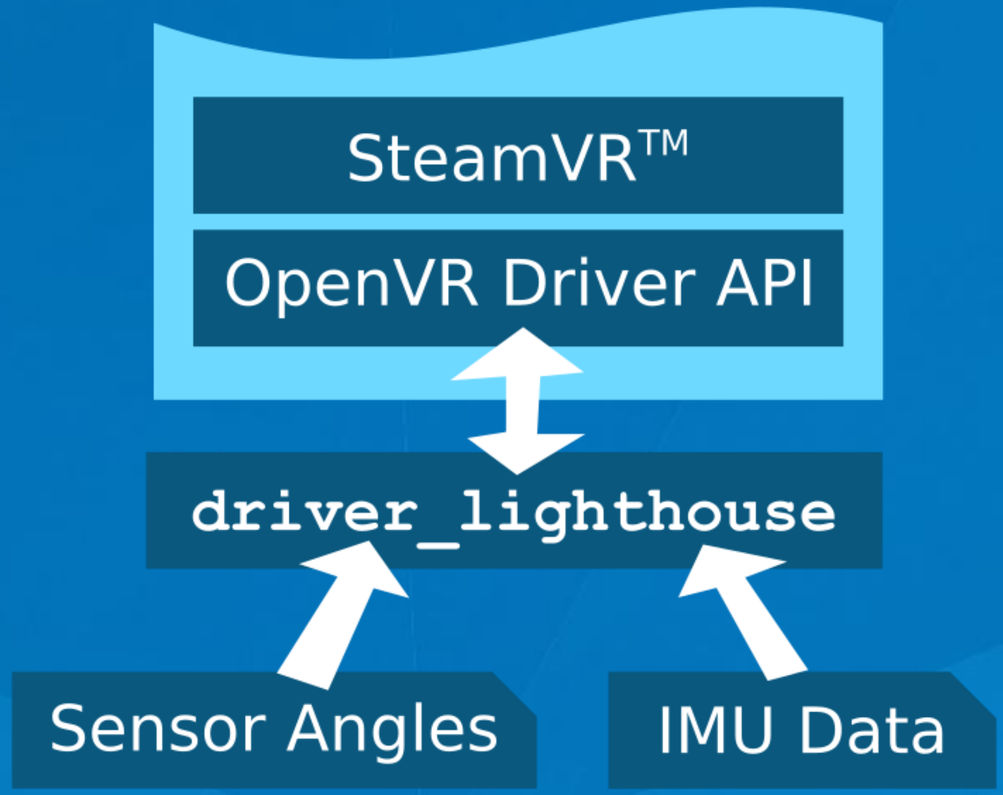
- A long flash is seen by all
- That starts the time
- Time is equivalent to angle
- Laser turns on and sweeps across the room
- Individual sensors measure the time, known own angle

Advantages

- Accuracy is only limited by timing accuracy
- Range is only limited by brightness and accuracy
- Unlimited users and objects
- No trick to identifying sensors – they identify themselves

On the Host

- Sensor angles and IMU data sent with low latency
- Driver uses OpenVR API



With Great VR comes Great Responsibility

TECHNOLOGY UPDATE

BASESTATIONS – SENSORS – ELECTRONICS

Technology Goals

- Make everything better
- Make standard components available
- Don't be a bottleneck
- Support licensees
- Reach a wider audience

TECHNOLOGY UPDATE

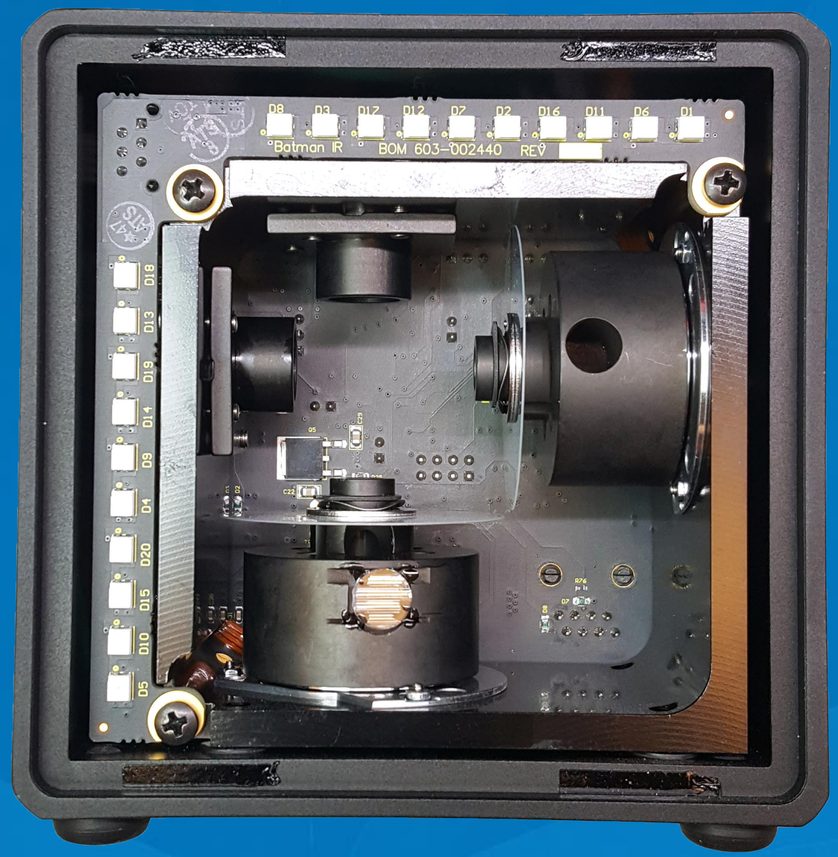
BASESTATIONS – SENSORS – ELECTRONICS

Basestation: 2014

- Hand machined by Valve
- About 50 ever made
- Built with surplus parts

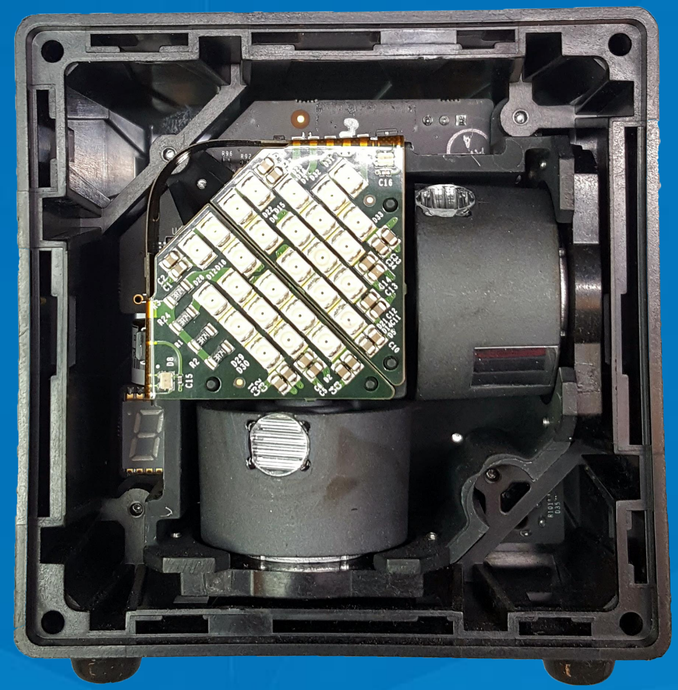
Basestation: GDC 2015

- Synapse built about 400
- Hand Calibrated
- Used in GDC 2015 for the demo booths where we revealed the Vive
- Used up all the motors and lasers



Basestation: 2015 Dev Kit

- Many thousand shipped to developers!
- Off the shelf components pressed into service

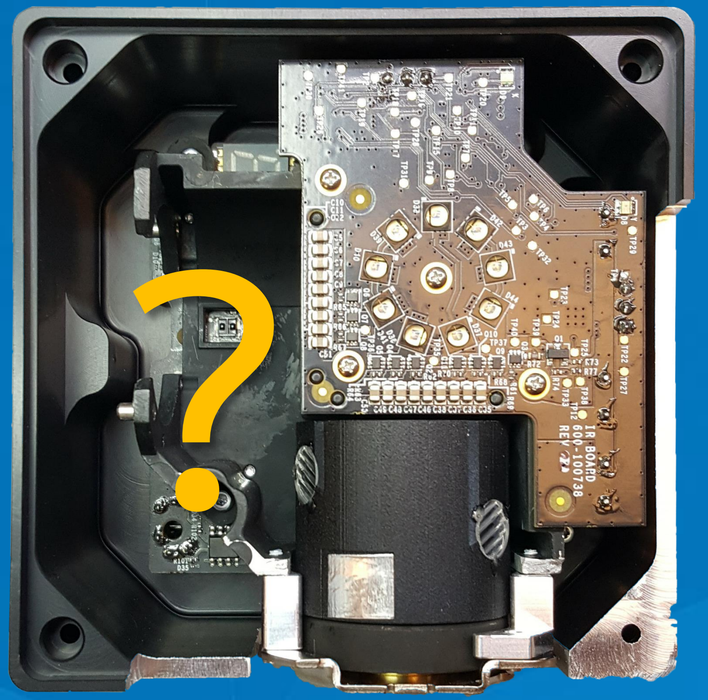


Basestation: HTC Vive

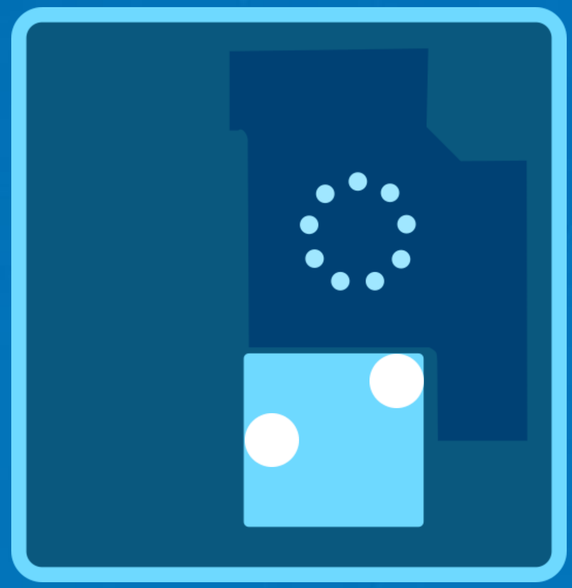
- Custom motors, lasers, and optics
- Many thousands have shipped

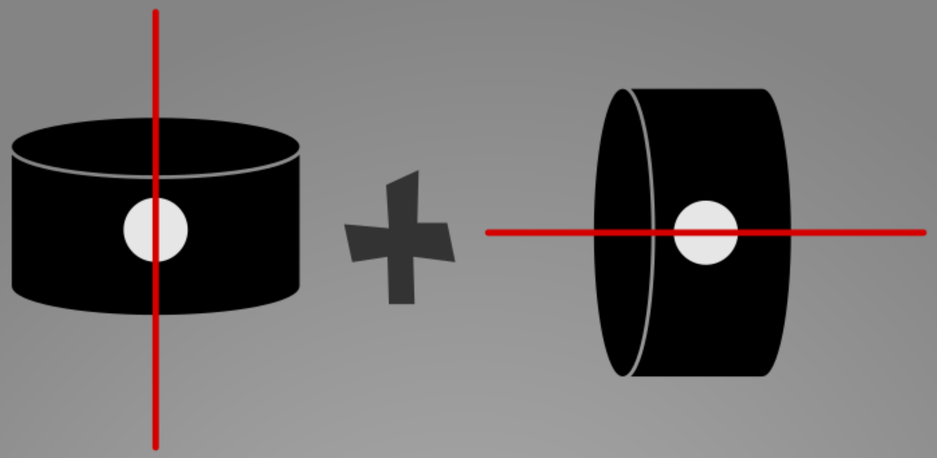
Basestation: Future

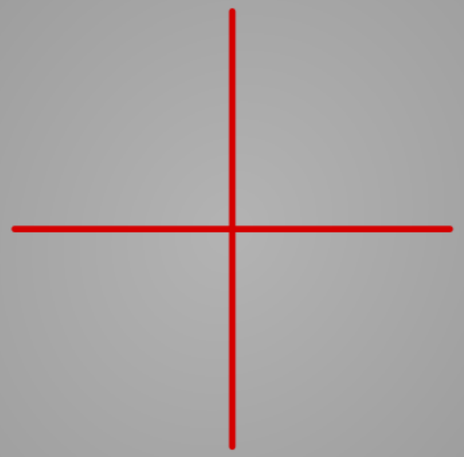
- Research platform
- Earlier version became HTC Vive base
- At right: Single rotor!

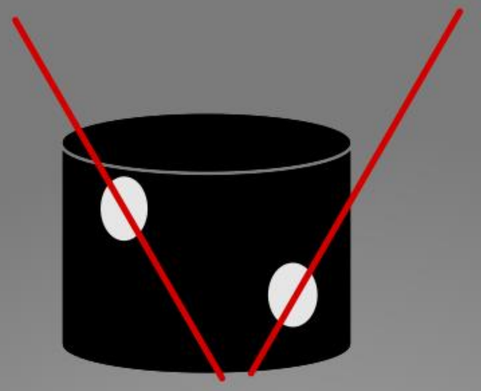


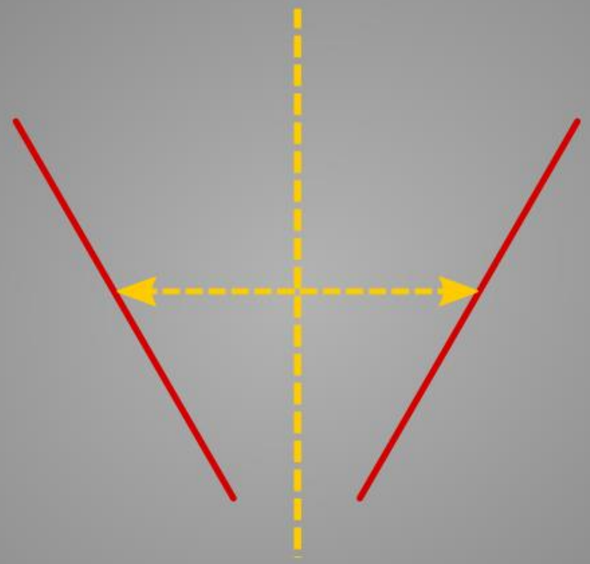
Single Rotor Visualized









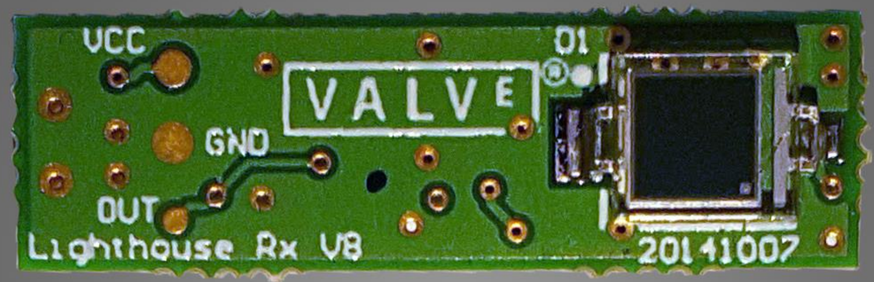


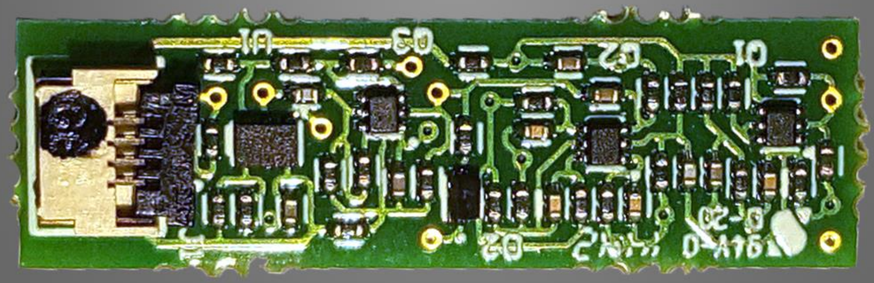
TECHNOLOGY UPDATE

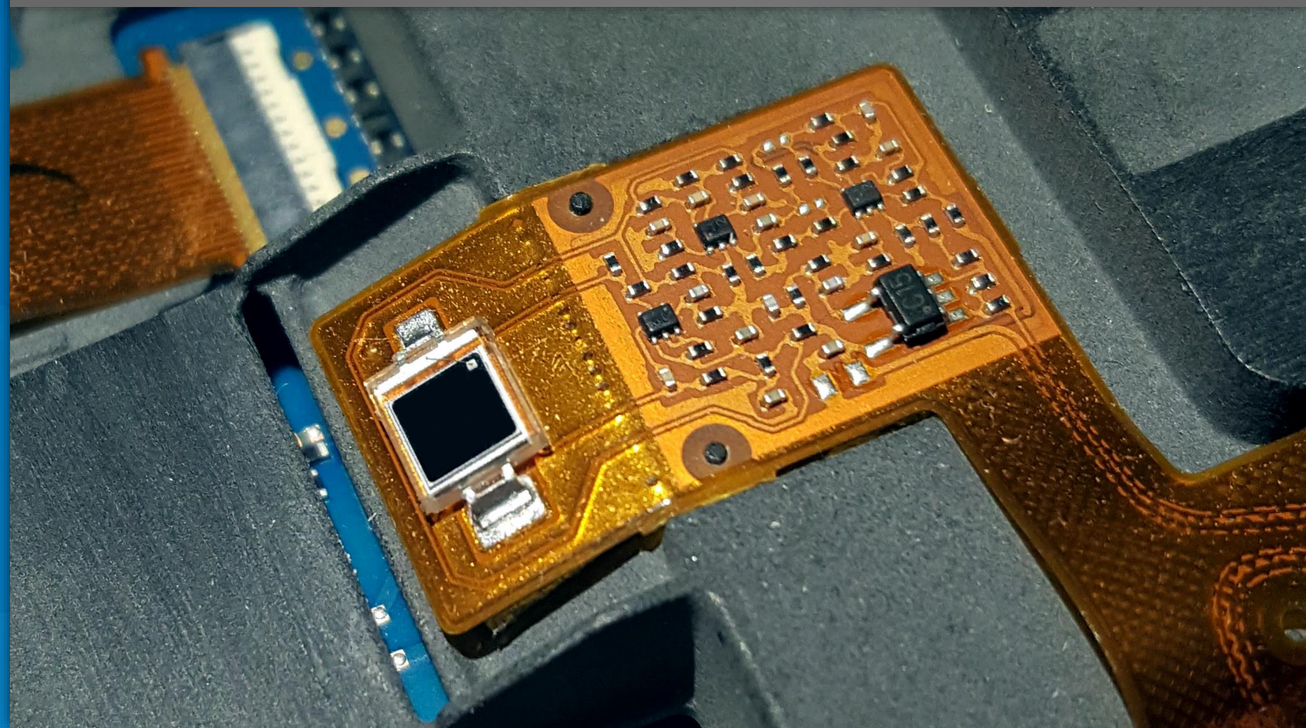
BASESTATIONS – SENSORS – ELECTRONICS

Sensors

- Top right, the “gumstick” board that powered the 2015 dev kits.
- About 40 components.
- Bottom right, the same design in an early Vive faceplate

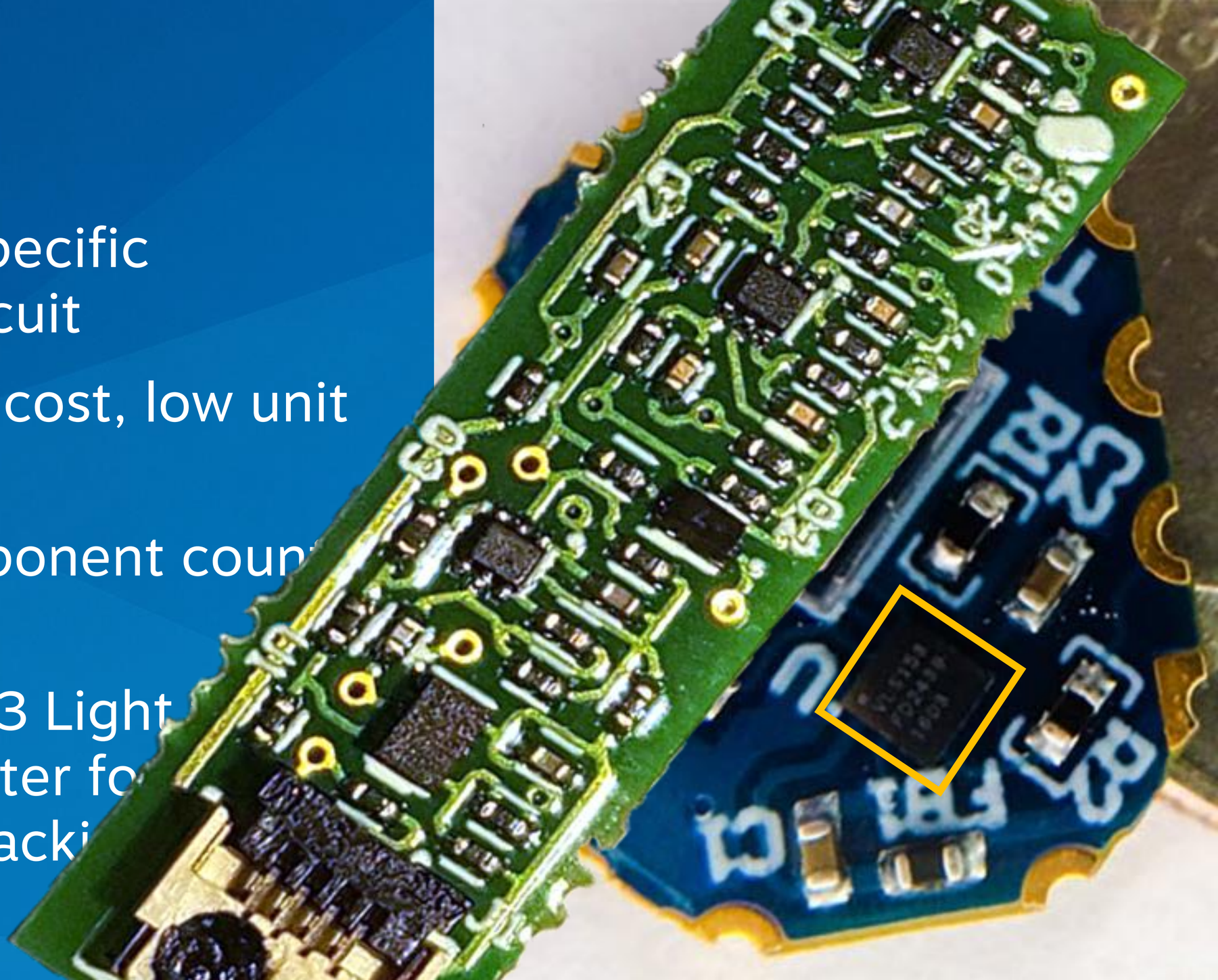






Sensor ASIC

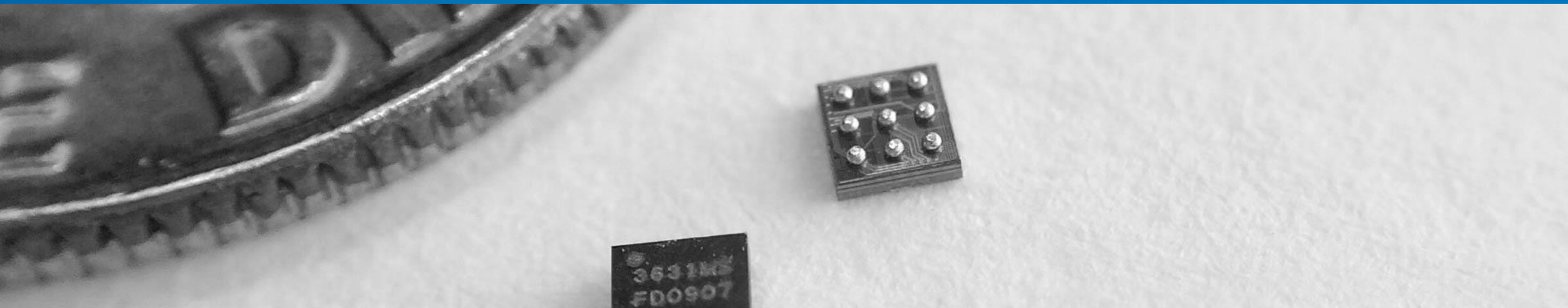
- Application-specific integrated circuit
- High up-front cost, low unit cost
- Reduces component coun dramatically.
- It’s the TS3633 Light Digital Converter fo SteamVR™ Tracki



Triad Semiconductor

Working with Valve since 2014 to build custom silicon for sensors.

www.triadsemi.com

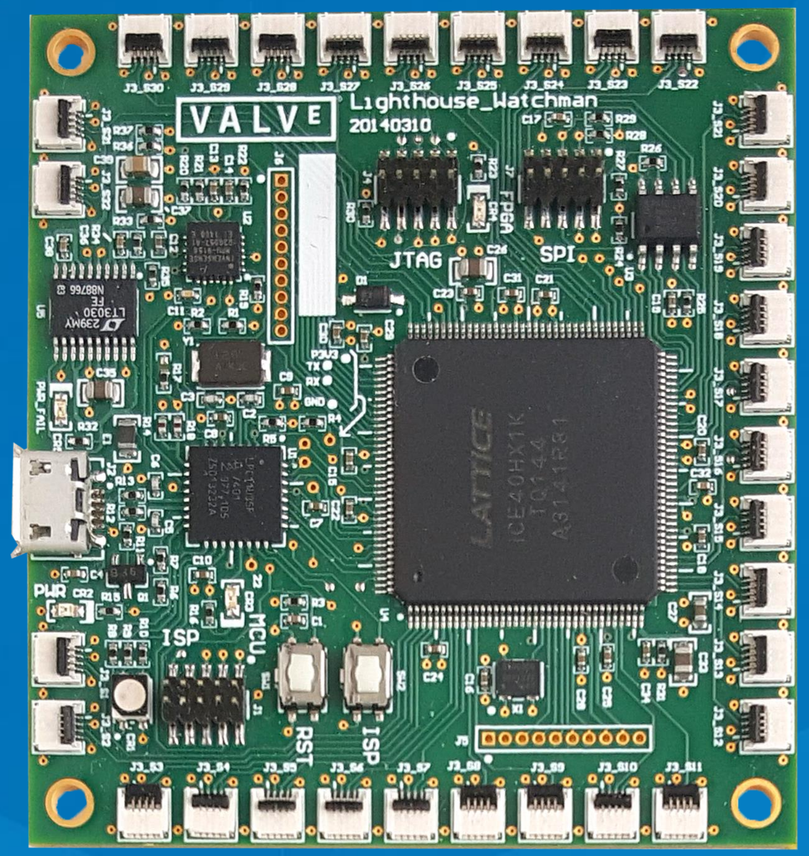


TECHNOLOGY UPDATE

BASESTATIONS – SENSORS – ELECTRONICS

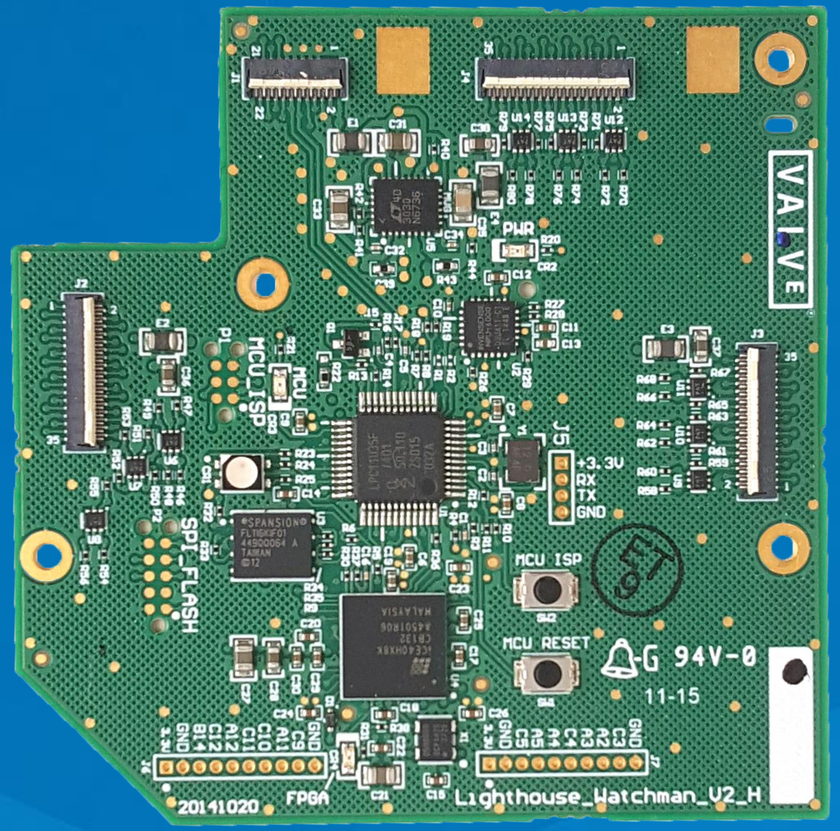
Watchman V1: Early 2014

- Individual connectors
- Good for HMDs, bad for controllers
- FPGA, MCU, and IMU



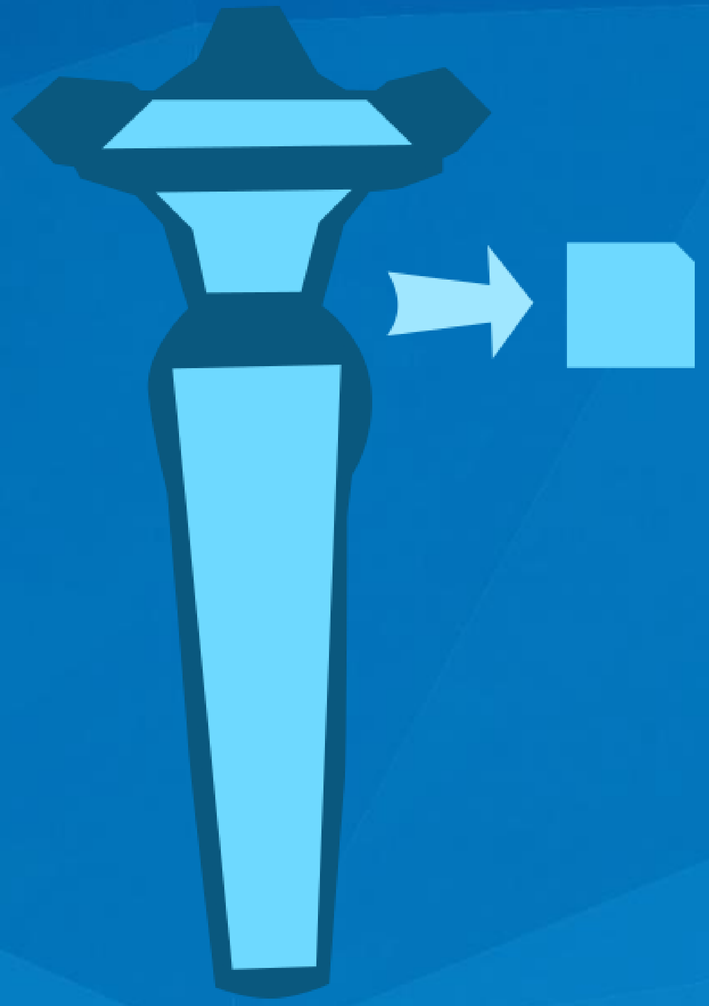
Watchman V2: Late 2014

- Mass produced for Mr Hat and dev kit Vives
- Still only tracking



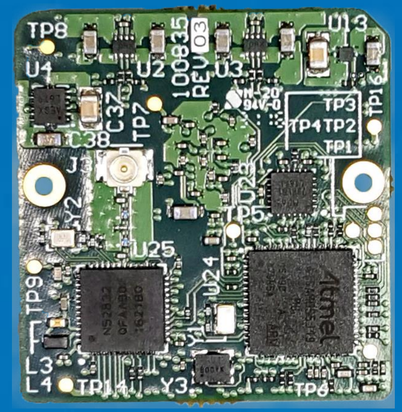
Watchman V3?

- Small form factor
- Modular
- Combine tracking, radio, and controller input



Watchman V3: 2016

- Tiny!
- Upgrades everything
- Includes radio, controller
- Fits in a controller handle
- Powers the HDK



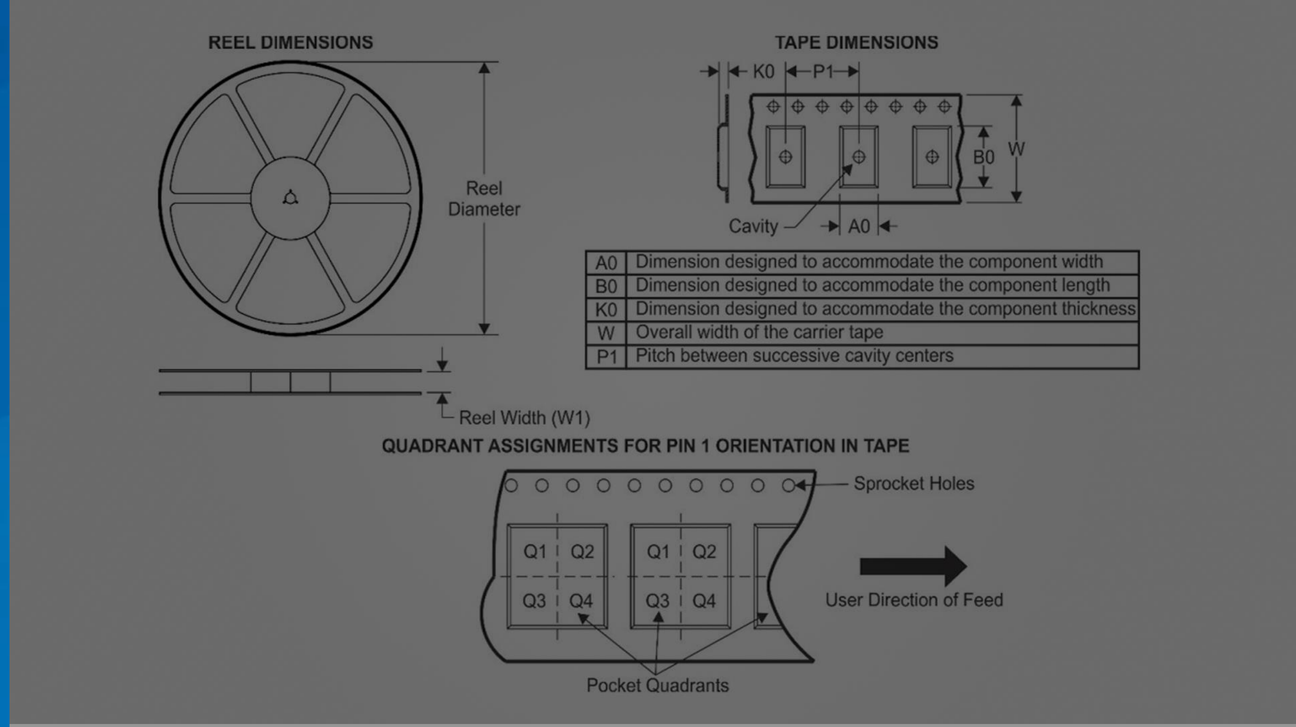
EXPANDING THE AUDIENCE

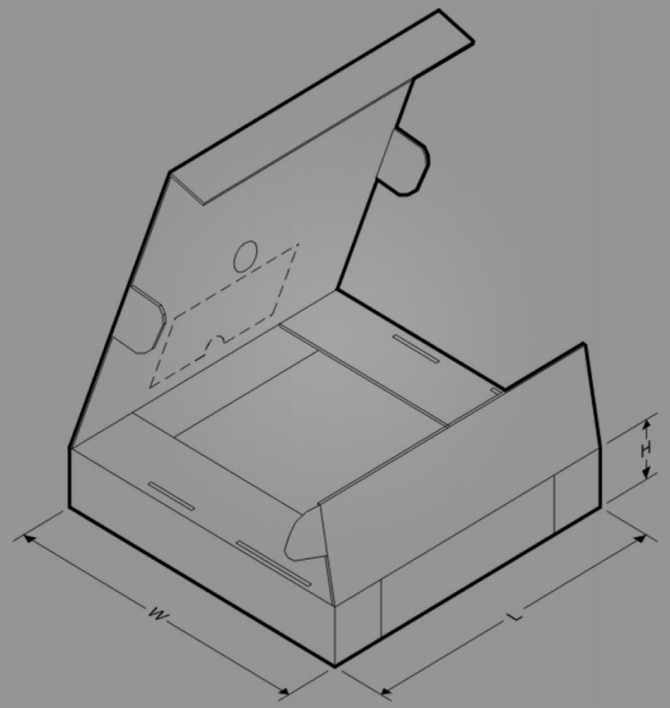
Basestations

- Critical to tracking quality
- Key to compatibility
- Valve will manufacture and OEM a basestation to enable hardware partners of all scales

Sensors

The TS3633 is available now from Triad Semiconductor in prototype and production quantities.





STEAMVR™ TRACKING CLASS

Tracked Objects

Valve is now making SteamVR™ Tracking fully available to other companies, without licensing fees.

We provide a reference object, electronics, documentation, and training. You provide the inspiration!

FOR INVENTORS, PRODUCT DESIGNERS, VR HACKERS, AND DEVICE MANUFACTURERS:

Use the World's Best 3D Tracking Technology, Royalty Free

STEAMVR TRACKING | HOW IT WORKS | BENEFITS | DEV KIT | EDUCATION | GET STARTED

SteamVR® Tracking

Whether you're building a VR golf club or an indoor quad-copter, 3D tracking is the heart of your product. Developed in-house at Valve, SteamVR Tracking is a hardware/software solution that lets your devices know in real time where they are, within a room. Valve is now making SteamVR Tracking fully available to other companies, without licensing fees.

SteamVR Tracking has three main components:

BASE STATION

- 120° multi-axis laser emitter
- Aside from power, fully self-contained - no cable connection to the host or tracked objects
- 2 base-stations can be used for 360° coverage

SENSORS ON TRACKED OBJECTS

- Lightweight, low power, low cost ASIC sensors
- Up to 32 sensors per object for full 360° coverage
- Software toolkit to calculate optimal sensor placement
- Built-in 1000Hz IMU for low latency, high resolution tracking
- Wireless communication with host for cable-free peripherials

HOST

- Integrates 3D positional information from multiple devices. For now, this means a PC.
- SteamVR API for accurate timing, synchronization, and prediction
- Compatibility with Steam and access to the full SteamVR catalog

Sign Up and Get Started

- Over 300 companies have signed up
- About 100 slots are available in scheduled classes between now and the end of the year
- http://steamvr.com/tracking

Synapse

- Synapse has been working with us on VR since 2014.
- They designed and manufactured the reference design for the class.
- They can help you do the same with your project.

Doug Bruey

SteamVR™ Tracking Employee of the Month

SYNAPSE

What the Class Covers

- SteamVR™ System Overview
- Object Design Criteria
- Development Tools
- Sensor Placement
- Sensor Covering
- Rapid Prototyping
- Test and Calibration
- The Render Model
- Tracking Evaluation
- Electrical System
- Firmware
- HDK

By Engineers, For Engineers

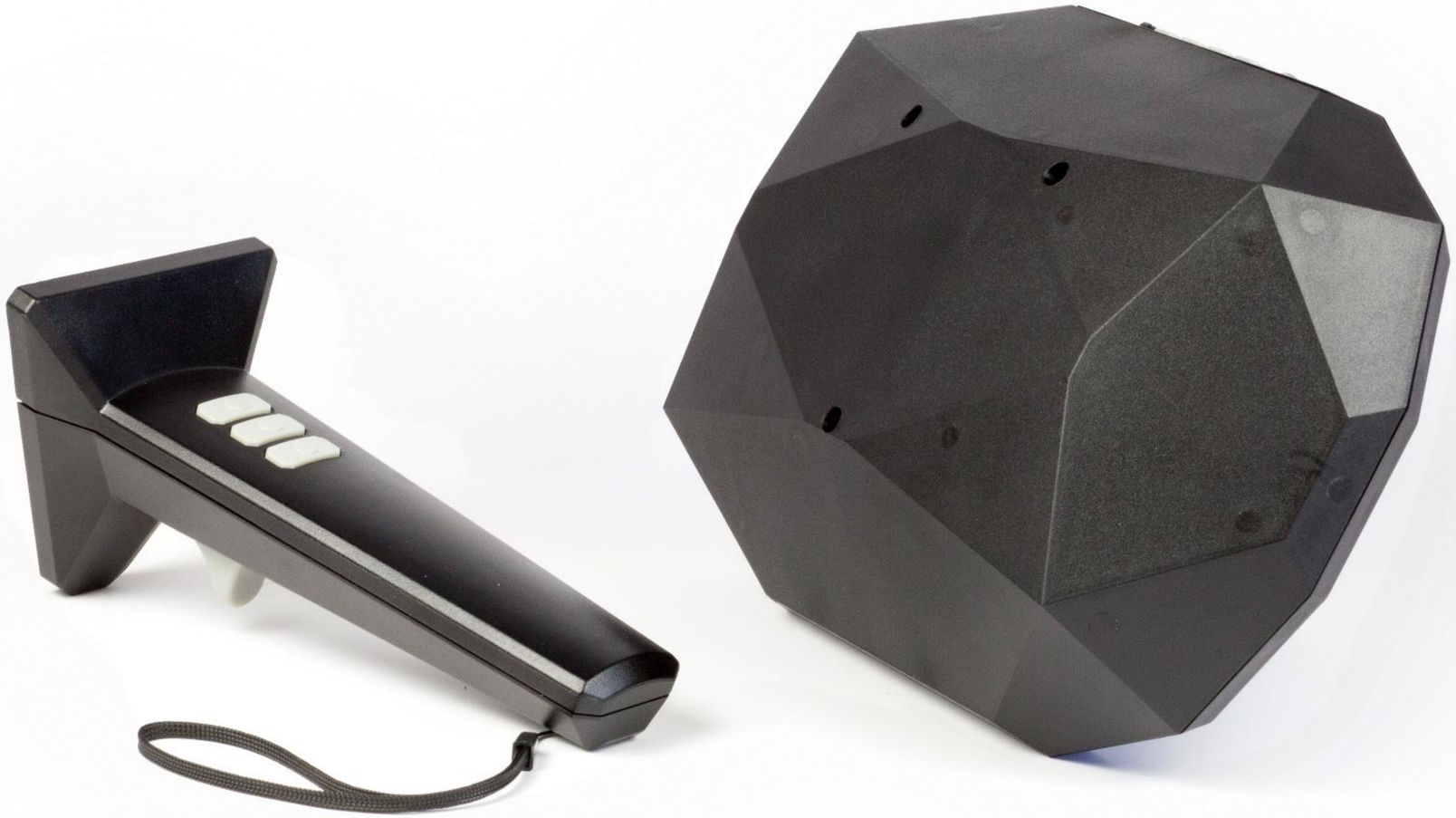
- Bring a mechanical engineer
- Bring an electrical engineer
- Bring an industrial designer if you can

Get Answers to your Questions

- Attend the class and get access to the forum
- http://steamcommunity.com/app/507090/discussions/
- Readable by everyone
- Get answers from other licensees, from Valve, and from Synapse

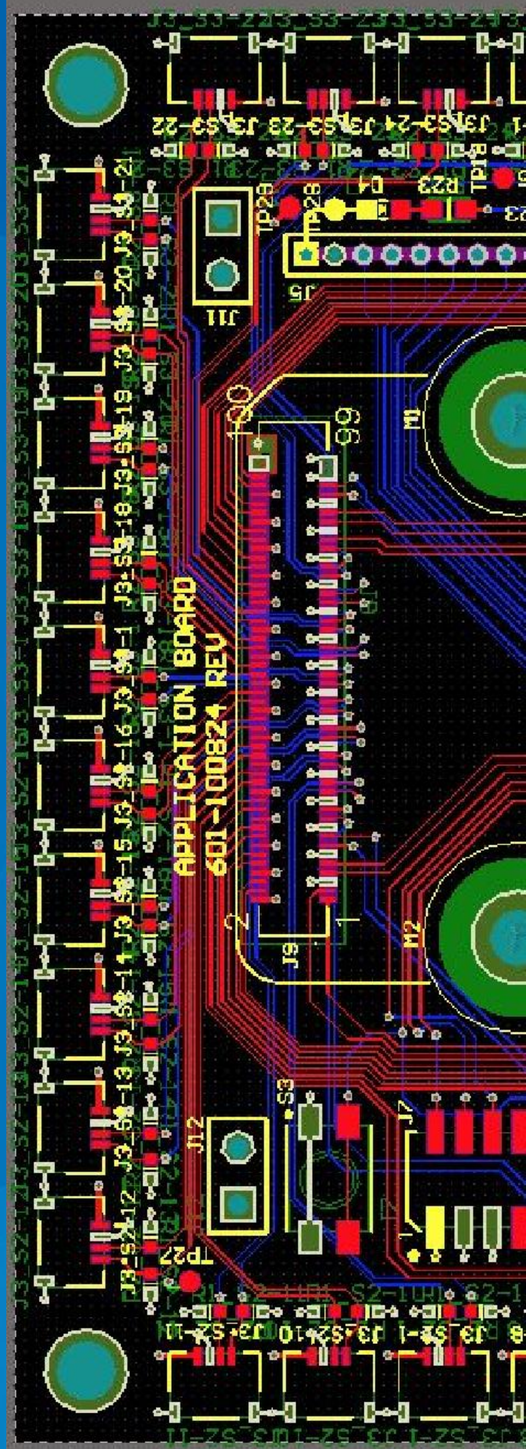
Licensee Dev Kit

Reference Hardware



Hardware Development Kit

- Everything needed to track controllers or an HMD
- Supports trackpads, haptics, and buttons
- Wired or wireless operation
- Can be battery or USB powered
- Includes quick prototyping options

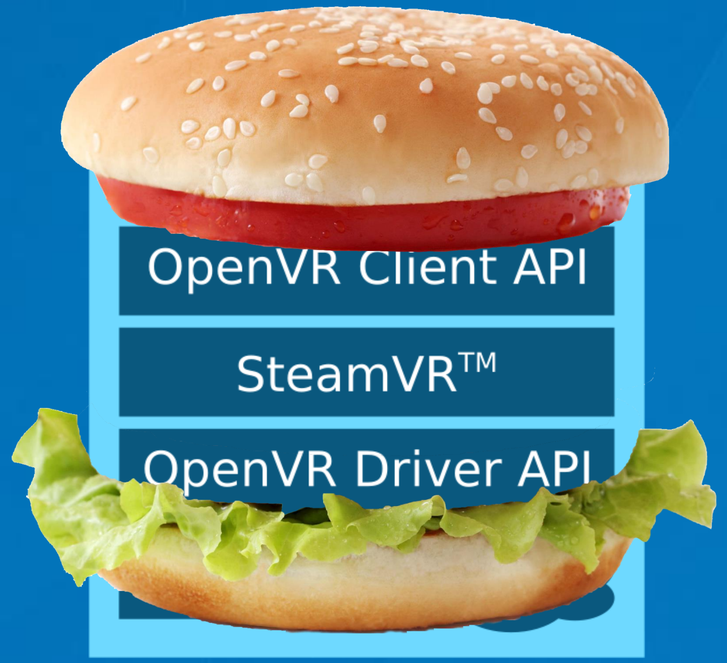


CONNECT YOUR THING TO EVERYTHING WITH OPENVR

The difference between SteamVR™ and

OpenVR API

- API for application developers
- API hardware developers
- SteamVR is the runtime
- Versioning and services to tie everything together



OpenVR

SteamVR™ Tracking

VALVE

htc

Licensees

Oculus
Razer Hydra
Leap Motion
OSVR
VRidge
Others...

Open Source

Razer Hydra Driver

- We shipped an open source Razer Hydra driver.
- Turned into a product by András Beck
- There are 28 forks of that on github, including a driver for Leap Motion.
- These drivers are bringing the tracked controller experience to all supported HMDs.

OpenVR for Low Level Developers

- Available under the 3-clause BSD license on github
- https://github.com/ValveSoftware/openvr
- Good example usage: Our Unity plugin (using the C# binding), the Hydra driver (and its forks), and open source engines like jMonkeyVR.

OpenVR for Game Developers

- Already integrated in popular game engines.
- Backwards compatibility is designed in, so you don’t have to worry about chasing driver versions.

Future Proofing

- Your game is going to keep working on future hardware.
- Our APIs will help you make that experience just as good as it is on the hardware you used to develop it
- Render models, button coordinates, hand assignments

OpenVR for Hardware Developers

- We’re happy to ship your drivers on Steam
- Driver version compatibility since the beginning of 2016
- We want your driver to be a success

Extending the API

- If you’re building something exotic enough that it’s not covered by the API, reach out to us
- A common API means a single target for developers

Beyond Cubes

- Bring up your OpenVR driver early
- Playtest with real content

GIVE US YOUR FEEDBACK!

benj@valvesoftware.com

This is why we have happy hour

Talk to Each Other!

- This year we invited all the tracking licensees
- Talk about what hardware would enable great new experiences
- Pitch your hardware idea and find people enthusiastic to build demo content

Q&A

http://steamvr.com/developer
http://steamvr.com/tracking